Some Like It Hot!
Intermediate Level

Purpose

To introduce students to the concepts of remote sensing and false colored images and to demonstrate exactly how a sensor displays heat sensing information in satellite photos and computer images

Overview

The students will use a thermometer to measure the heat radiating from the land cover types measured at the beginning level. They will recreate the thermal sensing map using a color code to depict thermal variations.

Time

Two to three class periods

Level

Intermediate

Key Concepts

- Orbiting satellites take photographs with cameras that are sensitive to a variety of different wavelengths.
- One of the main wavelengths sensed is thermal radiation or heat reflectance. The sensor reads the amount of heat being radiated and makes a picture out of the different values.
- When students observe something without touching it, they are actually using their eyes, ears, nose, and skin surface to remotely sense that object.

Skills

- *Observing* a given area
- *Measuring* different land types with a thermometer
- *Comparing* different areas for thermal radiance
- *Mapping* a thermal image

Materials and Tools

- Ruler
- Blank paper
- Rope or string
- Small thermometer
- Heavy paper cup
- Wire coat hanger

Preparation

A confined or roped off area of approximately 5-10 meter square that contains a variety of land cover types. For example, an area may include blacktop, grass, and bare ground.

Assemble the thermometer apparatus; however, if time permits, it may be constructed by students.

Prerequisites

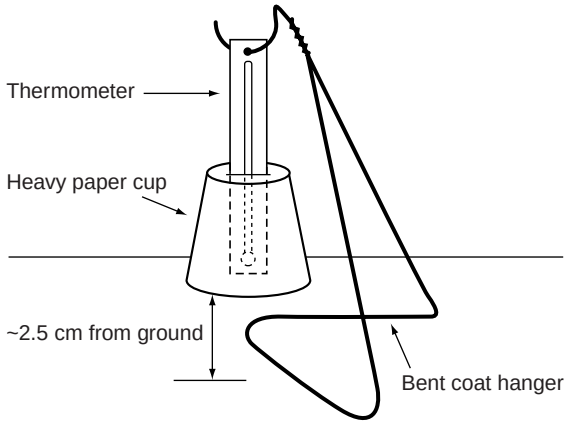
The beginning level activity is required.

The students need to know how to read a thermometer.

What To Do and How To Do It

1. Construct an infrared detector as shown in the illustration in Figure LAND-L-31: Thermometer Apparatus. This device is intended to measure the heat coming off an object and not from the air above. The paper cup works as a barrier to surrounding radiation. Look at the temperature gradients on the thermometer, assign colors to each range. For example, 0-5 = violet, 6-10=light blue, 11-15=aqua etc. until all degrees (in Celsius) are accounted for. These should be recorded in the Some Like It Hot Temperature Sheet found after *Some Like It Hot! Advanced Level.*

Figure LAND-L-31: Thermometer Apparatus



2. Using the thermometer apparatus, have the students measure the temperature coming from the same objects that they first measured with their hands in the beginning activity. Record the object temperature and appropriate color from the Some Like It Hot Temperature Sheet.
3. Staying in groups of two, the students go back out to the roped off area from the beginning activity and measure each land cover's temperature reflectance. Record the data and assign each cover type a color from the completed code on the Some Like It Hot Temperature Sheet.
4. Draw a map of the area. Label the temperature of each cover type and color the area with the appropriate color. On this map, the students should record the date, time, location and compass directions. Title this map, Temperature Sensor Map.

Discussion Questions

1. Compare the maps from the beginning activity and this activity. What are the differences?
2. By adding a temperature gradient how has the amount of color in the picture changed? Were there more or less total colors?
3. Are there any areas that were the same color on the heat sensor map that were different colors on the temperature sensor map? Why did this happen? If this did not happen on their map, the students should hypothesize why this could happen.
4. How close to the actual temperature reading were the students when they used their hands as heat sensors? The accuracy of the instrument in the beginning activity was their hands. Were some hands more sensitive than other students' hands?